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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/753,393	01/09/2004	Takashi Udagawa	Q79052	7899
23373	7590	10/05/2004	EXAMINER	
SUGHRUE MION, PLLC 2100 PENNSYLVANIA AVENUE, N.W. SUITE 800 WASHINGTON, DC 20037			MONDT, JOHANNES P	
			ART UNIT	PAPER NUMBER
			2826	

DATE MAILED: 10/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/753,393

Applicant(s)

UDAGAWA, TAKASHI

Examiner

Johannes P Mondt

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 22-27 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 22-27 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152..

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☒ Certified copies of the priority documents have been received in Application No. 09/885,943.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>1/904</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Information Disclosure Statement

The examiner has considered the items listed on the Information Disclosure Statement; a signed copy of Form PTO-1449 is herewith enclosed.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

1. **Claim 22** is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim contains subject matter not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor, at the time the application was filed, had possession of the claimed invention. In particular, not one of the single heterojunction light-emitting part structures that are disclosed in the Specification is a $\text{GaN}_{1-x}\text{P}_x$ light-emitting layer. Instead, at most a gallium nitride phosphide light-emitting part structure *containing* a gallium nitride phosphide layer is disclosed (cf. sections [0015], [0027], [0028], [0030], [0032]) in "Summary of the Invention". With regard to the Detailed Description: in the specific disclosure of a single heterostructure (cf. sections [0055]-[0067]) the light-emitting layer is a gallium indium nitride light emitting layer; that a $\text{GaN}_{1-x}\text{P}_x$ single crystal layer becomes a light-emitting layer (cf. section [0057]) is another matter,

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evidently implying additional processing steps in light of the final structure as disclosed as Figure 2. The claimed " $\text{GaN}_{1-x}\text{P}_x$ light emitting layer" of this disclosure actually is a $\text{GaN}_{1-x}\text{P}_x$ layer containing light emitting layer, whilst the only $\text{GaN}_{1-x}\text{P}_x$ contained within said light emitting layer has already been claimed as the $\text{GaN}_{1-x}\text{P}_x$ lower clad layer. Parenthetically, if there were an upper clad layer of the same constitution then the light-emitting device could not be a single heterojunction but instead it would be a double heterojunction structure because it would add a discontinuity in the band gap identical but at a different interface to the one already present. Also in the "Examples" no evidence of any disclosure of the invention according to claim 22 can be found: the only single hetero-junction (SH) devices discussed as examples are those of Examples 1 and 5. In Example 1 (Figures 1-2), the light-emitting layer 4 comprises a gallium indium nitride layer (cf. section [0073]) and thus cannot be called a $\text{GaN}_{1-x}\text{P}_x$ light emitting layer, while layer 4 in Figure 2 is a single layer and therefore must be interpreted as a single gallium indium nitride layer. With regard to Example 5, also with reference to Figure 2 with appropriate numerals inserted within brackets, the light-emitting layer 24 is a GaInN layer (cf. sections [0137]-[0147]). In summary, nowhere in the Specification Applicant discloses the now claimed single heterojunction light-emitting part structure of claim 22.

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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3. **Claims 24-27** recite the limitation "A group-III nitride semiconductor light-emitting device according to claim 1" in lines 1. There is insufficient antecedent basis for this limitation in the claim, because claim 1 has been canceled by preliminary amendment.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. **Claim 23** is rejected under 35 U.S.C. 103(a) as being unpatentable over Terashima et al (6,069,021) (see Information Disclosure Statement filed 01/09/2004) in view of Ishida et al (6,339,014 B1). *Terashima et al* teach a group-III nitride semiconductor light-emitting device (cf. title, abstract and col. 1) comprising (cf. Example 3) a single crystal substrate 101 (cf. col. 5, l. 6-22 and col. 13, l. 59-65), a boron phosphide (BP)-based buffer layer 102 (cf. col. 5, l. 6-22 and col. 14, l. 4-10) and a double hetero-junction light-emitting part structure containing a $\text{GaN}_{1-x}\text{As}_x$ lower clad layer 104 ($0 < x < 1$) (cf. col. 14, l. 52-60; N.B.: layer 104 is a GaN layer doped with As, which is a $\text{GaN}_{1-x}\text{As}_x$ layer), a $\text{Ga}\gamma\text{In}1-\gamma\text{N}$ ($0 \leq \gamma \leq 1$) light-emitting layer 105 (cf. col. 14, l. 65-col. 15, l. 3) and an $\text{Al}_z\text{Ga}_{1-z}\text{N}$ ($0 \leq z \leq 1$) upper clad layer 106 (cf. col. 15, l. 4-12; N.B. the parameter range for z as claimed includes the point $z=0$) having a conduction type (p-type) (cf. loc.cit.) opposite to that of the lower clad layer (which has n-type conductivity, see col. 14, l. 52).

Terashima et al do not necessarily teach the lower clad layer to be a $\text{GaN}_{1-x}\text{P}_x$ lower clad layer instead of a $\text{GaN}_{1-x}\text{As}_x$ lower clad layer, because *Terashima et al* teach doping the GaN layer 104 with As. However, it would have been obvious to use P instead of As for doping in view of *Ishida et al*, who, in a patent on a method for growing nitride compound semiconductors (cf. title and abstract), hence closely related to *Terashima et al*, teach at least the equivalence of using P rather than As for the growing of n-type GaN layers (cf. col. 6, l. 62 – col. 7, l. 15); given the use of P-doping in a prior step in *Terashima et al*, namely in the formation of the buffer layer 102 (cf. col. 13, l. 59-65 in *Terashima et al*) it would have been obvious to use the same dopant thus obviating the need for additional complexity in the manufacturing process, while the lattice matching achieved by selecting As as taught by *Terashima et al* could have been equally straightforwardly achieved through doping with P (phosphorous): in particular, the exploitation of the doping for the specific purpose of lattice matching can be equally achieved through the selection of P instead of As at the same stoichiometric ratio of $x=0.01$, considering that the lattice constant of $\text{GaN}_{1-x}\text{P}_x$ for $x=0.01$ (4.519 Å) is just as much substantially the same as the lattice constant of 4.520 Å of the surface portion of the buffer layer 110 above it (cf. Figure 2) as the lattice constant of $\text{GaN}_{1-x}\text{As}_x$ for the same value of $x=0.01$ (i.e., 4.521) (cf. col. 14, l. 52-60).

Motivation to replace As with P in this regard derives at least from the economic saving of using the P source already in use for the process of making the buffer layer 102 in the device by *Terashima* (cf. col. 13, l. l. 53-65) instead of having to use the As source (cf. col. 14, l. 43-50), and in addition from the obvious toxic nature of As.

Conclusion


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P Mondt whose telephone number is 571-272-1919. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JPM
September 30, 2004

Patent Examiner:


Johannes Mondt (Art Unit: 2826)